REMARKS:

The application now comprises claims 1-6 and 53-57.

Claims 1-5 were rejected under 35 USC §102(b) as being anticipated, and Claim 6 was rejected under 35 USC §103(a) as being obvious, based on Shiota, US patent 5,773,178 for the reasons previously stated. In regard thereto the examiner states that Shiota shows the existence of an isotropic liquid crystal layer formed under UV exposure in the absence of an electrical field. This is contrasted with applicants' allegedly contradictory claim to an isotropic film with aligned surface molecules. Claim 1 has been amended to clarify that the film formed is isotropic but has a surface that is capable of being subsequently aligned after formation of the film. The examiner acknowledges that applicant discloses polymer ordering at the surface (page 9, lines 24-26). However, the examiner does not accept that surface ordering is synonymous with alignment of the surface mesogens.

It is respectfully submitted that a basic principle of liquid crystal behaviour, well accepted in the art, is that an isotropic composition of mesogens comprises the liquid crystals in a disordered arrangement, or a bulk unaligned state. In other words, the liquid crystal molecules are positioned randomly, very much like liquids. When they are converted to their anisotropic or ordered phase the molecules are aligned in a crystalline-like manner. Prior but different compositions, such as polyimide based alignment films demonstrate the ability to be ordered or aligned after formation by rubbing (page 3, lines 8-15). However, because of the techniques necessary to form these films, which include solvent damage to other components in an assembly, polyimide alignment layers have limited utility. Applicants have discovered and claim an isotropic composition formed into a film comprising a polymerized homogenious mixture of reactive mesogen and epoxy having an exposed surface in which molecules can be ordered, or aligned by rubbing after polymerization of the film is complete. The composition of the reactive mesogen/epoxy comprising the film is the same in the bulk of the film as at the surface, the distinction being that the polymeric liquid crystal molecules within the surface can be subsequently order/aligned after formation of the film. Applicants' films, alignable after formation, are unique in that they can be readily formed and deposited without negatively effecting the other layers or components of the device. As set forth in the specification and shown in Figure 2, the epoxy and reactive mesogen in one embodiment are dissolved in a solvent, the mixture is cast on a substrate, the solvent is removed and the liquid crystal monomer/epoxy in the layer is photopolymerized. The desired alignment of the

molecules in the alignment layer (page 6, line 28 - page 7, line 6 and the 4th step of Fig. 2) is subsequent accomplished by brushing the exposed surface, ordering the molecules in the surface of the film (page 9, line 24-25; page 14, lines 22-31, page 16, lines 17-19).

In contrast, the Shiota film is either isotropic, accomplished by photopolymerization without an electrical field, or anisotropic accomplished by photopolymerization while under the influence of an electrical field. The Shiota liquid crystalline composition is incapable of being converted from an isotropic film to an anisotropic film after polymerization. In other words the cited reference does not teach polymerizing to form an isotropic Shiota film and then subsequently rendering the surface of that film aligned or ordered, such as set forth in applicant's claims, for example by rubbing.

The examiner has noted that claim 1 as previously presented contained a process step, namely the surface being subsequently aligned. This has been clarified by amending the claim to indicate that the polymerized liquid crystal molecules in the surface are capable of being subsequently aligned.

The examiner also indicated the presence of informalities in claims 2-6 which have been corrected by the present amendment. Accordingly, it is respectfully submitted that claim 1 is clearly patentable over Shiota and Shiota does not show or suggest applicant's claimed invention. Further, since claims 2-6 are dependent on allowable claim 1, they are likewise allowable.

Claims 53-57 were rejected under 35 USC §103(a) as being obvious, based on Shiota, US patent 5,773,178 in that Shiota et al

a) in regard to claim 53, shows orienting the liquid crystals to any desired angle, which could include an azimuthal orientation and the method of obtaining orientation does not materially affect the overall article,

b) in regard to claim 54, discloses a reactive mesogen of a UV curable diacrylate monomer, and

c) in regard to claim 55, while not disclosing a solvent, one skilled in the art would have found it obvious to use a solvent.

The bases of the rejection of claims 56 and 57 is not discussed but appears to be a result of being dependent on claim 54. It is noted the dependence on claim 54 is in error. The error is corrected by changing depending to claim 55.

As claim 1 is not shown or obvious based on the cited reference, claims 53-57 dependent thereon are likewise not obvious. Further, claim 53 has been amended to indicate that the molecules are capable of being azimuthally oriented by rubbing the film. The Shiota et al film is not shown to be, nor is it, capable of being oriented by rubbing, its order, orientation, or isotropic nature being set upon polymerization and not capable or being oriented, or its orientation changed, by any method after polymerization. In regard to claim 54 it is admitted that Shiota lists liquid crystalline diacrylate monomers but he fails to show or suggest that these monomers will polymerize when dispersed along with an epoxy as set forth in claim 1. In regard to claim 55 there is absolutely nothing in Shiota to suggest to one skilled in the art that a solvent could be added to the disclosed compositions. To the contrary Example 1 contains 99% of LCM1 and 1 % of a photoinitiator. All of the other examples use the same or substantially the same starting material which includes no solvent. Shiota therefore teaches away from using a solvent and one skilled in the art would not, based on the disclosure of Shiota, include a solvent for fear of not properly polymerizing the composition. The use of a solvent is further addressed below in regard to the Akashi reference.

Claims 55-57 were rejected under 35 USC §103(a) as being obvious, based on Shiota, US patent 5,773,178, in light of Akashi et al (US Patent 5,891,357 in that, while Shiota et al does not disclose a solvent, Akashi et al discloses a reactive mesogen and an epoxy dissolved in a solvent, including a ketone or toluene. It is further asserted by the examiner that it would have been obvious to one skilled in the art to add the solvents taught by Akashi et al to the compositions of Shiota as Akashi teaches dissolving mesogens of a liquid crystal composition in a solvent to produce "versatile compositions." It is respectfully submitted that one skilled in the art, based on the teachings of Akashi,would not have added the solvents of Akashi to the compositions of Shiota. If one were to do so in the manner taught by Akashia completely different composition and construction would have been produced and such composition and construction would have been completely different from that claimed by applicant. Still further, there is no showing in Akashi that the films produced have liquid crystals in the surface capable of being subsequently aligned, or render it obvious that combining the teachings of Akashi to Shiota would produce such a capability in the Shiota films which clearly have their ordering and orientation fixed on polymerization and not changeable after polymerization as claimed by applicants.

Akashi is directed to a very specific construction which has improved light scattering characteristics accomplished by providing a cross-linked macromolecular liquid crystal in a granular form dispersed in a binding resin (col 4, lines 11-24). The '357 patent discloses that the mesogen monomer may be copolymerized with a crosslinking monomer which may include a polyfunctional epoxy compound (col 6, lines 24-61). It is also disclosed (Example 1) that the macromolecular liquid crystal composition may be formed by dissolving the monomers in a solvent, such as MEK, for polymerization of the monomers. However, the optical properties of the resultant macromolecule is neither disclosed nor suggested. To use the resultant polymer it must be ground up and the granules then dispersed in a resin binder to produce discrete particles of the liquid crystals, as distinguished from molecules of the polymer, dispersed in the binder. The solvent dispersion technique disclosed has a similar result. The resin binder may be an epoxy resin (Col 8, line 38-50). Films prepared from this dispersion have a cloudy appearance and cause light to scatter strongly (col 11, lines 64-65; col 12, lines 15-16 and 54-56; col 13, lines 17-19). Accordingly, the reference teaches forming a mesogen/epoxy copolymer which is granulated and dispersed in a binder or a granulated macromolecular liquid crystal dispersed in a binder which, in either case may be an epoxy resin. In no event does the reference teach polymerized liquid crystals and epoxy molecules homogeneously distributed on a molecular level in the film, which can only result when the epoxy and reactive mesogen are mixed prior to polymerization of the reactive mesogen, resulting in a transparent and non-birefringent film (page 8, line21-27) which can subsequently be ordered. The Akashi reference teaches the exact opposite effect - a film with a cloudy appearance (anisotropic) and which causes light to scatter strongly that can be reversably rendered clear (isotropic) by application of heat (col14, lines 5-15). Applicant produces a clear film (isotropic) which can be aligned after formation.

Accordingly, it is respectfully submitted that Akashi teaches that the use of a solvent and the incorporation of an epoxy to create an anisotropic film with optical characteristics completely opposite to those claimed by applicant. If the teachings of Akashi were added to Shiota one skilled in the art would expect that the Shiota films, if they could be formed using the teachings of Akashi, would likewise be totally different from those claimed by applicants. The combination clearly teaches away from the claimed invention.

Claims 1-6 and 53-57 remain in the application. It is respectively submitted that these claims are patentable, fully supported by the Specification and not shown by the prior art. It is requested that the claims be found to be patentable and a Notice of Allowance be issued.

Respectfully submitted,

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By: _____

Michael J. Ram
Registration No. 26,379
Attorney for Applicant(s)

KOPPEL, JACOBS, PATRICK &HEYBL
555 St Charles Drive, Suite 107
Thousand Oaks, CA 91360
Phone (805) 373-0060
Fax (805) 373-0061

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